

AMENDMENTS TO THE CLAIMS

1. (Previously Presented) An apparatus, comprising:

a microfluidic trench to contain a target molecule, an array addressed device including a plurality of addressable cells, each of the plurality of addressable cells including at least two electrodes, the electrodes having structures and/or charge distributions similar to the target molecule;

an electrochemical detector;

and a spectroscope optically coupled to the array addressed device via a waveguide total internal reflection prism, wherein the waveguide total internal reflection prism is coupled to the microfluidic trench, wherein the array addressed device is configured to detect bonding and/or lack-of-bonding of the target molecule to the array addressed device.
2. (Original) The apparatus of claim 1, wherein the spectroscope includes an infrared spectroscope.
3. (Original) The apparatus of claim 2, wherein the infrared spectroscope includes a Fourier transform infrared spectroscope.
4. (Original) The apparatus of claim 2, wherein an infrared spectroscope signal from the infrared spectroscope is electromodulated by applying potential between the at

least two electrodes in at least one of the plurality of cells.

5. (Withdrawn) The apparatus of claim 2, wherein an infrared spectroscopy signal from the infrared spectroscopy is photo-modulated by applying a modulated UV-VIS signal to a surface of at least one of the at least two electrodes.

6. (Cancelled)

7. (Previously Presented) The apparatus of claim 1, wherein the waveguide includes a total internal reflection prism and the spectroscopy is optically coupled to the total internal reflection prism.

8. (Original) The apparatus of claim 1, wherein each of the plurality of addressable cells includes an individually addressable cell.

9. (Original) The apparatus of claim 8, wherein the individual addressable cell includes a first individually addressable electrode and a second individually addressable electrode.

10. (Original) The apparatus of claim 1, wherein each of the plurality of addressable cells includes a pair of electrodes that are less than approximately 200 microns in size and

the spacing of the electrodes is less than approximately 200 microns.

11. (Original) The apparatus of claim 10, wherein each of the pair of electrodes are less than approximately 100 nm in size.

12. (Original) The apparatus of claim 10, wherein the spacing of the pair of electrodes is less than approximately 100 nm.

13. (Original) The apparatus of claim 10, wherein each of the pair of electrodes includes at least one member selected from the group consisting of single-walled carbon nanotubes and silicon nano-wires.

14. (Previously Presented) An apparatus, comprising:

a microfluidic trench to contain one or more target molecules, an array addressed device including a plurality of addressable cells, each of the plurality of addressable cells including a first electrode and a second electrode, the first and/or second electrodes having structures and/or charge distributions similar to the one or more target molecules, wherein a first tip of the first electrode is located in the microfluidic trench and electronically coupled to a first trace via a first conductive plug and a second tip of the second electrode is located in the microfluidic trench and electronically coupled to a second trace via a second conductive plug;

an electrochemical detector;

a spectroscope optically coupled to the array addressed device, wherein the plurality of addressable cells comprise a plurality of sensor elements wherein each of the sensor elements is functionalized to interact with the one or more target molecules;

a control circuitry coupled to the sensor elements, wherein the control circuitry is configured to detect interactions of the sensor elements with the one or more target molecules; and

memory coupled to the control circuitry, wherein the control circuitry is configured to store data corresponding to the plurality of sensor elements in the memory, wherein the apparatus is a hand-held device.

15. (Original) The apparatus of claim 14, wherein the plurality of sensor elements are configured as a two-dimensional array and are addressable using memory cell techniques.

16 (Original) The apparatus of claim 15, wherein the plurality of sensor elements are addressable by corresponding rows and columns of the two-dimensional array.

17-18. (Cancelled)

19. (Original) The apparatus of claim 1, further comprising a microfluidic channel

coupled to at least one of the addressable cells.

20. (Original) The apparatus of claim 1, further comprising a selective membrane coupled to at least one of the addressable cells.

21. (Original) The apparatus of claim 20, wherein the selective membrane includes at least one member selected from the group consisting of chemically selective membranes and biologically selective membranes.

22-53. (Cancelled)

54. (Previously Presented) The apparatus of claim 1, wherein the target molecule comprises DNA.

55. (Previously Presented) The apparatus of claim 14, wherein the one or more target molecules comprises DNA.

56. (New) The apparatus of claim 1, wherein the electrodes are solid state electrodes.

57. (New) The apparatus of claim 1, wherein the structures and/or charge distribution similar to the target molecule is based on DNA molecular recognition ability.

- 58. (New) The apparatus of claim 14, further comprising a signal amplifier.
- 59. (New) The apparatus of claim 14, further comprising a video display.